

Listing of Claims:

1. (Currently Amended) An optical DNA sensor comprising:
a solid imaging device which is configured to have a
plurality of types of DNA probes each including a different
nucleotide sequence arrayed and fixed on a surface of the solid
5 imaging device;

a plurality of photoelectric elements provided in the solid
imaging device; and

~~a transparent conductive layer which is provided in the
solid imaging device between the DNA probes and the plurality of
photoelectric elements, and to which a voltage is applied to
10 attract a nucleotide strand~~

an exciting light absorbing layer provided between the DNA
probes and the photoelectric elements to absorb exciting light; and

a conductive layer which discharges charges caused by
15 electron-hole pairs generated by the absorbed exciting light in
the exciting light absorbing layer.

Claims 2 and 3 (Canceled).

4. (Previously Presented) The optical DNA sensor as claimed
in claim 1, wherein each of the photoelectric elements comprises
a field effect transistor which has a semiconductor layer that
generates electric charges by receiving light.

5. (Currently Amended) An optical DNA sensor comprising:

a solid imaging device,

an exciting light absorbing layer which absorbs exciting light, and which is formed on a surface of the solid imaging device, and which is configured to have a plurality of types of DNA probes each including a different nucleotide sequence aligned and fixed on the exciting light absorbing layer,

a plurality of photoelectric elements provided in the solid imaging device, and

~~a transparent conductive layer which is provided in the solid imaging device between the DNA probes and the plurality of photoelectric elements, and to which a voltage is applied to attract a nucleotide strand~~

a conductive layer which discharges charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting light absorbing layer.

Claims 6-7 (Canceled).

8. (Currently Amended) An optical DNA sensor comprising:

a solid imaging device having a transparent substrate;

a plurality of photoelectric elements which are arranged apart from each other on a surface of the transparent substrate

5 and each of which includes ~~include~~ a bottom gate electrode having
a shading property, a semiconductor layer having a light
sensitivity, and a light-transmissive top gate electrode, wherein
the bottom gate electrode, the semiconductor layer and the light-
transmissive top gate electrode are layered in order on the
10 transparent substrate;

means for applying negative voltage to the light-
transmissive top gate electrode in a charge storage period;

a light-transmissive protective layer which coats the
plurality of photoelectric elements, and which is configured to
15 have a plurality of types of DNA probes each including a
different nucleotide sequence aligned and fixed thereon; ~~and~~

a transparent conductive layer which is provided in the
solid imaging device between the DNA probes and the plurality of
photoelectric elements; ~~[[,]] and to which a voltage is applied~~
20 ~~to attract a nucleotide strand~~

means for applying one of a positive voltage and a ground
potential to the transparent conductive layer.

Claim 9 (Canceled).

10. (Currently Amended) A DNA reading apparatus comprising:
(i) an optical DNA sensor which comprises:

a solid imaging device having a transparent substrate;

a plurality of photoelectric elements which are
5 arranged apart from each other on a surface of the transparent
substrate and each of which ~~include~~ includes a bottom gate
electrode having a shading property, a semiconductor layer having
a light sensitivity, and a light-transmissive top gate electrode,
wherein the bottom gate electrode, the semiconductor layer and
10 the light-transmissive top gate electrode are layered in order on
the transparent substrate;

means for applying negative voltage to the light-
transmissive top gate electrode in a charge storage period;

a light-transmissive protective layer which coats the
15 plurality of photoelectric elements, and which is configured to
have a plurality of types of DNA probes each including a
different nucleotide sequence aligned and fixed thereon; and

a transparent conductive layer which is provided in the
solid imaging device between the DNA probes and the plurality of
20 photoelectric elements; ~~[[,]] and to which a voltage is applied~~
~~to attract a nucleotide strand~~

means for applying one of a positive voltage and a
ground potential to the transparent conductive layer; and

(ii) a light irradiation member which irradiates phosphor
25 exciting light toward a rear surface of the transparent substrate
of the solid imaging device.

11. (Original) A DNA reading apparatus as claimed in claim 10, wherein the light irradiation member is disposed below the optical DNA sensor.

12. (Previously Presented) A DNA reading apparatus as claimed in claim 11, wherein the light irradiation member irradiates the phosphor exciting light to the DNA probes through the solid imaging device.

13. (Previously Presented) A DNA reading apparatus as claimed in claim 11, wherein the light irradiation member irradiates both the plurality of types of DNA probes and the solid imaging device, and the phosphor exciting light irradiated
5 by the light irradiation member has a wavelength in a range which excites a fluorescent substance that labels a sample DNA bondable to an appropriate one of the DNA probes but does not sufficiently excite the solid imaging device.

Claims 14-16 (Canceled).

17. (Previously Presented) A DNA reading apparatus as claimed in claim 12, wherein the light irradiation member irradiates both the plurality of types of DNA probes and the solid imaging device, and the phosphor exciting light irradiated

5 by the light irradiation member has a wavelength in a range which excites a fluorescent substance that labels a sample DNA bondable to an appropriate one of the DNA probes but does not sufficiently excite the solid imaging device.

18. (New) The optical DNA sensor as claimed in claim 4, wherein the semiconductor layer of the field effect transistor has light sensitivity, and wherein the field effect transistor also has a bottom gate electrode and a light-transmissive top
5 gate electrode.

19. (New) The optical DNA sensor as claimed in claim 18, wherein a negative voltage is applied to the light-transmissive top gate electrode.

20. (New) The optical DNA sensor as claimed in claim 1, wherein one of a positive voltage and a ground potential is applied to the conductive layer.

21. (New) The optical DNA sensor as claimed in claim 1, further comprising a protective insulated layer between the conductive layer and the plurality of photoelectric elements.